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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Hiroaki TANAKA et al.

Serial No. 09/867,423

GROUP 2871

Filed May 31, 2001

COLOR LIQUID CRYSTAL DISPLAY DEVICE
AND MANUFACTURING METHOD OF THE SAME

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

In compliance with Rules 1.97 and 1.98, and in fulfillment of the duty of disclosure under Rule 1.56, the accompanying documents, copies of which are attached to this statement, are made of record on the enclosed sheet.

A concise explanation of the relevance of these items is given in the attached material.

Respectfully submitted,

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Our comments

(1) Differences between the present invention and Japanese Patent Laid-Open Publication No. 2000-164886 are as follows:

In the Japanese Patent Laid-Open Publication No. 2000-164886, full plate etching for a conductive layer (60), an ohmic contact layer (50) and a semiconductor layer (40) is performed, as shown in Figs. 16 to 21. However, performing the conductive layer (60), the ohmic contact layer (50) and the semiconductor layer (40) full plate etching in manufacturing the TFT substrate generally leaves a large step difference at the island portion, which raises a problem that it becomes difficult to control the orientation of the liquid crystal molecules particularly in the IPS (In Plane Switching) mode for driving the liquid crystal by a lateral electric field. Also, the coverage of the passivation film is deteriorated, which results in a problem that the materials forming the source and drain electrodes dissolve into the liquid crystal and readily induce unwanted smear on the display during the operation of the liquid crystal display device.

In the present invention, also, an island (220) of a thin film transistor and a drain bus line (202) are formed by depositing a gate insulating film (103), a semiconductor layer (104), an ohmic layer (105), a second conductive film (106) and patterning them. However, according to the present invention, it is possible to suppress the occurrence of the foregoing problems because the step difference at the island is compensated with a black matrix (240) and a planarization film (107). Consequently, the liquid crystal display device attains better orientation control and becomes more reliable.

(2) Differences between the present invention and Japanese Patent Laid-Open Publication No. 2001-5038 are as follows:

In the Japanese Patent Laid-Open Publication No. 2001-5038, a drain electrode and a source electrode are formed by etching for a conductive layer (60), an ohmic contact layer (50) and a semiconductor layer (40), using a photoresist (114) as a mask.

On the other hand, in the present invention, a drain electrode and a source electrode are formed by removing a second conductive film (106) and ohmic layer (105) in a region corresponding to a channel region by using a black matrix (240) as a mask. Therefore, the number of the PR processes can be reduced.

(3) Differences between the present invention and pp. 1006-1009 SID 00 DIGEST are as follows:

In the SID 00 DIGEST, a SD (source and drain electrodes) and n^+ Si/a-Si layer full plate etching is performed. However, performing the SD and n^+ Si/a-Si layer full plate etching in manufacturing the TFT substrate generally leaves a large step difference at the island portion, which raises a problem that it becomes difficult to control the orientation of the liquid crystal molecules particularly in the IPS (In Plane Switching) mode for driving the liquid crystal by a lateral electric field. Also, the coverage of the passivation film is deteriorated, which results in a problem that the materials forming the source and drain electrodes dissolve into the liquid crystal and readily induce unwanted smear on the display during the operation of the liquid crystal display device.

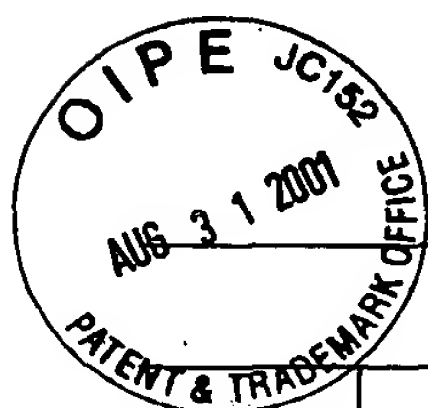
On the other hand, in the present invention, an island (220) of a thin film transistor and a drain bus line (202) are formed by depositing a gate insulating film (103), a semiconductor layer (104), an ohmic layer (105), a second conductive film (106) and patterning them. However, according to the present invention, it is possible to suppress the occurrence of the foregoing problems because the step difference at the island is compensated with a black matrix (240) and a planarization film (107). Consequently, the liquid crystal display device attains better orientation control and becomes more reliable.

FORM PTO-1449 U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use several sheets if necessary)

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Hiroaki TANAKA et al.

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GROUP

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	PATENT NUMBER	ISSUE DATE	PATENTEE	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
AA						
AD						

FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

	DOCUMENT NO.	PUBL. DATE	COUNTRY OR PATENT OFFICE	CLASS	SUB CLASS	TRANSLATION YES NO
AL	2000-164886	6/00	Japan			Abst.
AM	2001-005038	1/01	Japan			Abst.
AN						
AO						
AP						
AR						
AS						

OTHER DOCUMENTS (Including Author, Title, Date, Relevant Pages, Place of Publication)

AT	Kim, C.W. et al., "A Novel Four-Mask-Count Process architecture for TFT-LCDs" , <u>SID 00 Digest</u> , pp. 1006-1009.
AU	
AV	

EXAMINER

DATE CONSIDERED

EXAMINER: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.